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Home Greenhouse Gardening Structures

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HOME GREENHOUSE GARDENING STRUCTURES

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This bulletin gives details for building some of the simple structures used to grow plants. It also discusses small structures of a more complicated nature that may be obtained from commercial sources.

WOOD FOR GREENHOUSE STRUCTURES

Redwood, chestnut, cypress, and cedar are the most desirable woods for greenhouse structures. Redwood is the best now available. White pine, maple and other less durable woods may be used, but rarely last more than a few years even when they have been treated to prevent decay.

Heartwood grades of redwood are best because they are more decay resistant than sapwood. Of the heartwood grades available, the following are best in the order listed: clear all heart, select heart, construction heart, and bench. Because of the corrosive effects of compounds contained in redwood, it is best to use brass, copper, aluminum, or hot-dipped galvanized nails, screws or bolts to fasten the wood.

Preservative materials containing copper or zinc are satisfactory for treating wood to be used in greenhouse construction. Wood that has been treated for decay resistance with creosote, mercury, or pentachlorophenol compounds in any form must not be used in greenhouses, however. Toxic fumes from these materials will kill or injure plants.

SEED FLATS

Most garden flowers are started in seed pots or flats and transplanted to their final flowering location. Sometimes seedlings are transplanted from the seed flat to a cold frame before going into the final location in the garden.

The simplest structure for starting seeds in the home is a standard greenhouse flat or flower pot with a piece of glass cut to fit over it (figures 1 and 2). A plastic bag is safer than glass and may be used in its place. Glass or plastic maintains the humidity and moisture in the flat in a good range for the germination of seed. As soon as seedlings develop their first true leaves, the plastic should be removed to allow the young plants to receive good ventilation.

Detailed information on starting flowers from seed is contained in another Cornell extension bulletin.

Figure 1 (above). Wooden seeding flats covered with glass and plastic

Figure 2 (right). Clay flower pots covered with glass and plastic bag.

COLDFRAMES

A coldframe utilizes the sun's heat. The soil is heated during the day and gives off its heat at night to keep the plants warm. No artificial heat of any kind is applied. The frame may be banked with straw or strawy manure to insulate it from the outside air and to retain heat. Insulating mats can be placed over the sash at night to conserve the heat of the sun, and allow you to start plants earlier in the spring. Such mats are made of straw, bamboo, paper, or cloth.

Coldframes are used to harden plants that were started in hotbeds or in the greenhouse before transplanting them to the field in spring. The process of hardening matures succulent tissues that the plants develop in the greenhouse. This reduces injury from unexpected temperature drops and decreases the chance of wilting injury after transplanting if the plants are exposed to conditions favoring rapid drying.

Coldframes also are used for azaleas, heather, hydrangeas, Christmas cherries, bulbs, and perennials. Bulbs and perennials may be forced into flower a few weeks before normal if they are started in coldframes early in the season. These plants are grown directly in the ground, and the sash is placed over them in early spring.

Chrysanthemum stock plants and biennials are sometimes placed in coldframes for winter protection; cyclamen, azaleas, and other plants are grown in frames during the summer. To provide partial shade during the summer, lath sashes or rolls of snow fencing can be used in place of glass on coldframes or on hotbeds.

The standard coldframe sash is 3 feet wide by 6 feet long, with three rows of 10 inch glass lapped to allow the water to run lengthwise. Construction of the

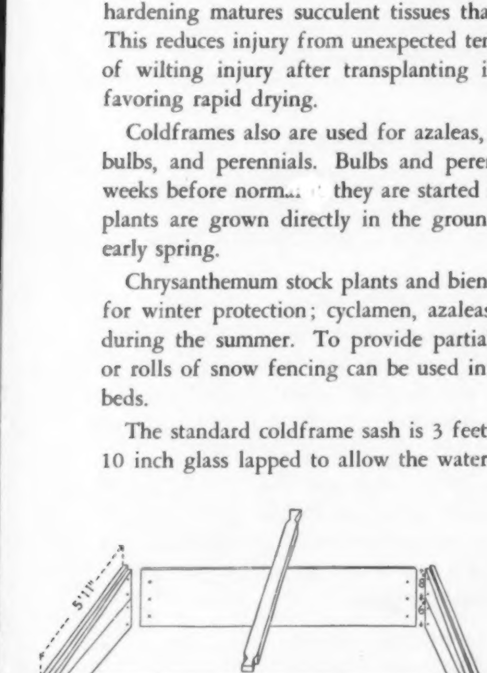


Figure 3. Construction details of a coldframe.

sash is made simpler by using plastic. The various materials available for glazing are discussed in the section on plastics.

The frame (figure 3) is 5 feet 11 inches wide outside and can be built to any length in multiples of 3 feet; that is 6, 9, 12, and so forth. The frame may be set on the ground, or the base may be partly buried with soil to prevent air from entering below the boards.

Materials needed for the construction of a two-sash coldframe are:

1 piece of wood 2 inches X 8 inches X 6 feet
1 piece of wood 2 inches X 14 inches X 6 feet
1 piece of wood 2 inches X 2 inches X 6 feet
2 pieces of wood 2 inches X 6 inches X 5 feet 11 inches
2 pieces of wood 1 inch X 3 inches X 5 feet 11 inches
2 pieces of wood 2 inches X (8 inches tapered to 2 inches) X 5 feet 11 inches
(This may be made from one 2 inch X 10 inch X 5 feet)
Wood 1-inch thick may be substituted throughout, but is less rigid than the 2-inch wood.
2 L-irons 2 inches X 2 inches X 6 inches
2 L-irons 2 inches X 2 inches X 12 inches
24 round-headed bolts $\frac{3}{8}$ inches X 3 inches with washers
30 number 8 nails

HEATED FRAMES AND HOTBEDS

Heated frames are similar in construction to coldframes. The walls are sometimes insulated (figure 4) and they are usually high enough to permit tall-growing plants to be placed in them. Artificial heat is supplied by steam, hot water, or electricity.

Heated frames are preferred for bulbs, azaleas, hyrdangeas, chrysanthemum stock and for bedding plants in early spring if greenhouse space is not available.

Hotbeds are used largely for starting seeds before they are planted in coldframes and for summer propagation of cuttings from woody plants. The soil temperature remains higher than in a heated frame. Electric cable[1] is used most often for heat.

Construction of the hotbed is like that of the coldframe, with the addition of an 8-inch board below ground level. Details of construction are shown in figure 6. A 12-inch layer of cinders below the hotbed provides both insulation and drainage. A 1-inch layer of sand or soil acts as a bed for the electric heating cable, which is laid in rows 6 inches apart on the sand.

[1]Electric heating cable may be obtained from any local building supply firm. Choose a type that is designed for outdoor use.

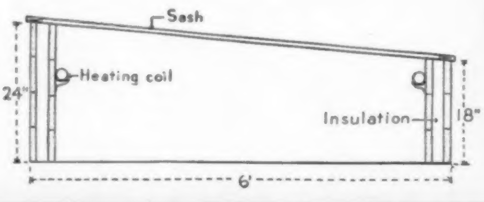


Figure 4. A heated frame.

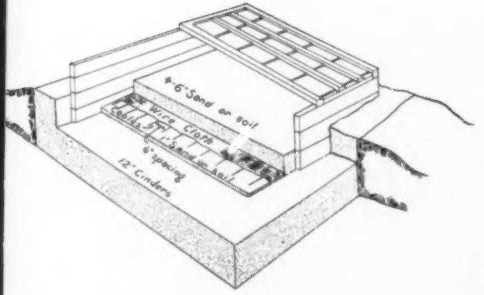


Figure 5. An electric hotbed.

Hardware cloth of ½ or ¼ inch mesh is laid directly on the cable to act as a heat conductor and keep temperatures in the propagating medium uniform. Soil or coarse sand is then placed on the hardware cloth to a depth of 4 to 6 inches.

Additional information on hotbeds may be obtained from USDA leaflet number 445 *Electric Heating of Hotbeds,* available for five cents from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D.C.

GLASS GREENHOUSES

It is best to contact a greenhouse-construction company[2] for details of glass greenhouse construction. They are equipped to furnish plans and materials for the most satisfactory structure, and will also outline the best arrangement of benches and walks.

Many greenhouse-construction companies have hobby-type greenhouses that are relatively inexpensive. They can be purchased in kit form for owner construction, or can be erected by the company at a nominal cost. Two types of glass greenhouses are shown in figure 6 and on the cover.

PLASTIC GREENHOUSES

Flexible sheet plastics can be used for covering greenhouses. The price of sheet plastic varies from 2 cents to 17 cents per square foot. The cheapest plastic on the market is polyethylene. The life of polyethylene is estimated at 3 months during the summer and 9 months during the winter. The breakdown of this plastic and of many plastics is caused by the ultraviolet rays of the sun. As a general rule, the more expensive the plastic, the longer it lasts The sheet plastics may be obtained in a variety of thicknesses and widths.

The thicknesses normally used in covering greenhouses vary from 2 mils (.002 inches) to 15 mils (.015 inches); the thicker the plastic, the more expensive per square foot. The width of the plastic sheets varies from about 2 feet to 40 feet.

[2]A list of greenhouse-construction companies may be obtained by writing to the Department of Floriculture and Ornamental Horticulture, Cornell University, Ithaca, New York

Plastics may also be obtained in comparatively thick (1/16 to 1/8 inch) rigid panels. The cost per square foot of this material is greater than for flexible sheet plastic, but the life is much longer. Rigid plastic panels, are not so clear as the flexible sheet plastics. This would not be a problem during the summer, but in the winter months when light intensity is naturally low, only the crops that require low light intensity, such as African violets, foliage plants and orchids, can be grown successfully.

Because the field of plastics is changing so rapidly, and new types are coming on the market almost every day, it is best to check with your county agent about the type to fit your needs.

A large number of plastic houses have been designed; they can be divided into three major types: conventional, sash, and quonset.

Conventional

The conventional plastic greenhouse (figure 7) is built with the same general design as the glass house. Sheet plastic is rolled on, either vertically or horizontally, and stapled to the roof and side bars. After the plastic has been applied, wood lath is tacked over the bars. If the house is to be used during the winter months and is expected to carry a snow-load, the roof bars should be no farther than 20 inches apart.

Ventilation is similar to a glass house, except for the vent mechanism which is much simpler. Exhaust fans can be substituted for ventilators, but should be large enough to remove all the air in the house once each minute in the summer, and once each ten minutes during the winter.

Figure 6. Lean-to type glass hobby greenhouse with an aluminum frame.

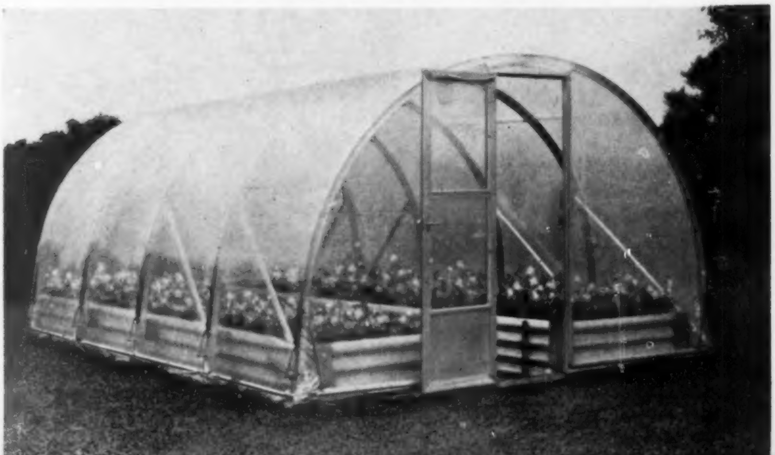
Photograph from Lord and Burnham Company

Figure 7. Conventional type plastic covered greenhouse with wooden framing.

Figure 8. Lean-to type sash greenhouse covered with plastic.

Figure 9. Quonset type greenhouse with flexible sheet plastic stretched over an aluminum frame.

This and cover photographs from Lord and Burnham Company



Sash

The general shape of the sash greenhouse is the same as a conventional greenhouse except for the roof which is made up of panels or sashes (figure 8). The panels can range in size to 4 by 15 feet and are constructed to slide in channels on the roof. The panels are covered with sheet plastic and are light and easy to handle. Ventilation is achieved by sliding the panels up and down. The advantages of this house are that the panels can be covered indoors, and can be removed from the house and stored in a dark room when the greenhouse is not being used. This greatly increases the life of the plastic.

Quonset

Quonset greenhouses have the same general shape as the quonset huts of World War II (figure 9). The half-circle frames are made either of wood or metal, and covered with one piece of wide plastic. These houses are constructed up to 20 feet wide. The advantage of this house is the ease of erection and of covering. Ventilation is by exhaust fans at the ends of the houses.

Further information on plastic greenhouses is contained in a Cornell leaflet on plastic greenhouse construction and use.

HEATING

Because of the many small heating systems available and the many variables associated with heating greenhouses, no attempt is made to give recommendations for the heating plant needed. Consultation with a reputable heating engineer is recommended. Most greenhouse construction companies employ heating engineers for this specific purpose.

GLAZING

Coldframe glass usually is fastened with brads and is not puttied. The sash should be painted before glazing.

Greenhouse glass is set in putty or glazing compound that makes an air-tight, water-tight joint. The use of aluminum bar-caps on the sash bars reduces the need for continual maintenance and also prolongs the life of wooden bars.

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